

SECTION 15182 - STEAM AND CONDENSATE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes steam and condensate piping and specialties for systems up to 80 psig, inside the building.
- B. Related Sections include the following:
 - 1. Division 15 Section "Basic Mechanical Materials and Methods" for general piping materials and installation requirements.
 - 2. Division 15 Section "Hangers and Supports" for pipe supports, product descriptions, and installation requirements. Hanger and support spacing is specified in this Section.
 - 3. Division 15 Section "Valves" for general-duty gate, globe, ball, butterfly, and check valves.
 - 4. Division 15 Section "Mechanical Identification" for labeling and identifying steam and condensate piping.
 - 5. Division 15 Section "Control Systems and Equipment" for temperature-control valves and sensors.

1.3 DEFINITIONS

- A. HP Systems: High-pressure systems operating at 15 psig or more.
- B. LP Systems: Low-pressure systems operating at less than 15 psig.

1.4 SYSTEM DESCRIPTION

- A. Steam and condensate piping for this Project is a two-pipe, gravity flow and pumped system.

1.5 SUBMITTALS

- A. Product Data: For each type of special-duty valve and steam trap indicated, including rated capacities and accessories.
- B. Maintenance Data: For steam traps to include in maintenance manuals specified in Division 1.

1.6 QUALITY ASSURANCE

- A. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp flash tanks to comply with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1.

1.7 COORDINATION

- A. Coordinate layout and installation of steam and condensate piping and suspension system components with other construction, including light fixtures, hydronic piping, water and sewer piping, fire-suppression-system components, and partition assemblies.
- B. Coordinate pipe sleeve installation for foundation wall penetrations.
- C. Coordinate pipe fitting pressure classes with products specified in related Sections.
- D. Coordinate installation of pipe sleeves for penetrations through exterior walls and floor assemblies. Coordinate with requirements for firestopping specified in Division 7 Section "Through-Penetration Firestop Systems" for fire and smoke wall and floor assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Steam Traps:
 - a. Armstrong International, Inc.
 - b. Barnes & Jones, Inc.
 - c. Dunham-Bush, Inc.
 - d. ITT Hoffman; ITT Fluid Technology Corp.
 - e. Spirax Sarco, Inc.
 - f. Sterling, Inc.

2.2 PIPING MATERIALS

- A. General: Refer to Part 3 piping application articles for applications of pipe and fitting materials.

2.3 STEEL PIPE AND FITTINGS

- A. Steel Pipe, NPS 2 (DN 50) and Smaller: ASTM A 53, Type S (seamless), Grade A, Schedules 40 and 80, black steel, plain ends.
 - 1. Steel Pipe Nipples: ASTM A 733, made of ASTM A 53, Schedules 40 and 80, black steel; seamless for NPS 2 and smaller.

2.4 VALVES

- A. Gate, globe, check, ball, and butterfly valves are specified in Division 15 Section "Valves."
- B. Refer to Part 3 "Valve Applications" Article for applications of each valve.

2.5 STEAM TRAPS

- A. Float and Thermostatic Traps: ASTM A 126, cast-iron body and bolted cap; renewable, stainless-steel float mechanism with renewable, hardened stainless-steel head and seat; maximum operating pressure of 125 psig; balanced-pressure, stainless-steel or monel thermostatic bellow element.
 - 1. Thermostatic air vent capable of withstanding 45 deg F (25 deg C) of superheat and resisting water hammer without sustaining damage.

PART 3 - EXECUTION**3.1 LP STEAM PIPING APPLICATIONS**

- A. Steam Piping, NPS 2 and Smaller: Schedule 40 steel pipe, with threaded joints using Class 125 cast-iron fittings.
- B. Condensate Piping, NPS 2 and Smaller: Schedule 80 steel pipe, with threaded joints using Class 125 malleable-iron fittings.

3.2 HP STEAM PIPING APPLICATIONS

- A. Steam Piping, NPS 2 and Smaller: Schedule 40 steel pipe, with threaded joints using Class 300 malleable-iron fittings.

3.3 VALVE APPLICATIONS

- A. General-Duty Valve Applications: Unless otherwise indicated, use the following valve types:
 - 1. Shutoff Duty: Gate and ball valves.
 - 2. Throttling Duty: Globe and ball valves.
- B. Install shutoff-duty valves at each branch connection to supply mains, at inlet connection to each steam trap, and elsewhere as indicated.

3.4 LP STEAM-TRAP APPLICATIONS

- A. Float and Thermostatic Traps: Steam main and riser drip legs, heating coils, humidifiers, autoclaves, and sterilizers.

3.5 PIPING INSTALLATIONS

- A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping installation requirements.
- B. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
- C. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.
- D. Install steam supply piping at a uniform grade of 0.2 percent downward in direction of steam flow.
- E. Install gravity flow condensate return piping at a uniform grade of 0.4 percent downward in direction of condensate flow.
- F. Reduce pipe sizes using eccentric reducer fitting installed with level side down.
- G. Unless otherwise indicated, install branch connections to steam mains using 45-degree fittings in main pipe, with the takeoff coming out the top of the main pipe. Use of 90-degree tee fittings is permissible if 45-degree fittings are impractical. If length of branch takeoff is less than 10 feet, pitch branch line down toward mains at a 0.4 percent grade.
- H. Install unions in piping NPS 2 and smaller adjacent to each valve, at final connections of each piece of equipment, and elsewhere as indicated.
- I. Install strainers on supply side of each control valve, pressure-reducing valve, solenoid valve, traps, and elsewhere as indicated. Install NPS 3/4 nipple and ball valve in blowdown connection of strainers NPS 2 and larger. Match size of strainer blowoff connection for strainers smaller than NPS 2.
- J. Anchor piping for proper direction of expansion and contraction.
- K. Install drip legs at low points and natural drainage points such as ends of mains, bottoms of risers, and ahead of pressure regulators, control valves, isolation valves, pipe bends, and expansion joints.
 - 1. On straight runs with no natural drainage points, install drip legs at intervals not exceeding 300 feet where pipe is pitched down in direction of steam flow and a maximum of 150 feet where pipe is pitched up in direction of steam flow.
 - 2. Size drip legs at vertical risers same size as pipe and extend beyond rise. Size drip legs at other locations same diameter as main.
 - 3. Install gate valve at drip legs, dirt pockets, and strainer blowdowns to allow removal of dirt and scale.
 - 4. Install steam traps close to drip legs.
- L. Pitch condensate piping down toward flash tank. If more than one condensate pipe discharges into flash tank, install a swing check valve in each line. Install thermostatic air vent at top of tank. Install inverted bucket or float and thermostatic trap at low-pressure condensate outlet, sized for three times the condensate load. Install safety valve at tank top. Install pressure gage, gate valve, and swing check valve on low-pressure (flash) steam outlet.

3.6 STEAM-TRAP INSTALLATION

- A. Install steam traps in accessible locations as close as possible to connected equipment, but not more than 48 inches from connected equipment.
 - 1. Unless otherwise indicated, install gate valve, strainer, and union upstream from trap; install union, check valve, and gate valve downstream from trap.

3.7 HANGERS AND SUPPORTS

- A. Hanger, support, and anchor devices are specified in Division 15 Section "Hangers and Supports."
- B. Install the following pipe attachments:
 - 1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
 - 2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
 - 3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
- C. Install hangers with the following maximum spacing and minimum rod sizes:
 - 1. NPS 3/4: Maximum span, 9 feet; minimum rod size, 1/4 inch.
 - 2. NPS 1: Maximum span, 9 feet; minimum rod size, 1/4 inch.
 - 3. NPS 1-1/2: Maximum span, 12 feet; minimum rod size, 3/8 inch.
 - 4. NPS 2 : Maximum span, 13 feet; minimum rod size, 3/8 inch.

3.8 PIPE JOINT CONSTRUCTION

- A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for joint construction requirements for threaded, welded, and flanged joints.

3.9 TERMINAL EQUIPMENT CONNECTIONS

- A. Size for supply and return piping connections shall be same as for equipment connections.
- B. Install traps and control valves in accessible locations close to connected equipment.
- C. Install bypass piping with globe valve around control valve. If multiple, parallel control valves are installed, only one bypass is required.

3.10 FIELD QUALITY CONTROL

- A. Prepare steam and condensate piping according to ASME B31.9 and as follows:
 - 1. Leave joints, including welds, uninsulated and exposed for examination during test.
 - 2. Flush system with clean water. Clean strainers.
 - 3. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
 - 4. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.

- B. Perform the following tests on steam and condensate piping:
 - 1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
 - 2. While filling system, use vents installed at high points of system to release trapped air. Use drip legs installed at low points for complete draining of liquid.
 - 3. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the design pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed either 90 percent of specified minimum yield strength or 1.7 times "SE" value in Appendix A of ASME B31.9, "Building Services Piping."
 - 4. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
 - 5. Prepare written report of testing.

3.11 ADJUSTING

- A. Mark calibrated nameplates of pump discharge valves after steam and condensate system balancing has been completed, to permanently indicate final balanced position.
- B. Perform these adjustments before operating the system:
 - 1. Open valves to fully open position.
 - 2. Check operation of automatic bypass valves.

3.12 CLEANING

- A. Flush steam and condensate piping with clean water. Remove and clean or replace strainer screens.

END OF SECTION 15182